Semi-Annual Progress Report

Composition, Properties, and Structure of Proteins, Amino Acids, and Peptides (unclassified)

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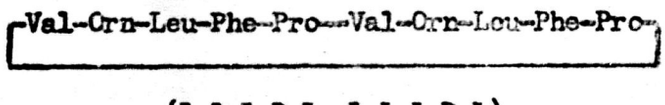
Preparation of L- and D-Amino Acids: D-Glutamic acid and D-valine were prepared by enzymic resolution, D-tyrosine by alkaloid resolution. On account of difficulties with the enzymic procedures, D-ornithine, D-glutamic acid and D-serine are being prepared by alkaloid resolution.

Synthetic Peptides: The Boissonnas method for the synthesis of dipeptides was further refined. The finding that racemization takes place in the synthesis of tripeptides by this method was confirmed by other investigators. However the Boissonnas procedure was used satisfactorily without racemization in the synthesis of tripeptides by coupling N-carbobenzoxy amino acids (e.g., Z.Ala.OH) with dipeptide esters (e.g., H.Ala-Ala.OBz). A new method for peptide synthesis using chlorphosphites has been reported in the literature and is under investigation.

The systematic synthesis of isomeric dipeptides and isomeric tripeptides containing alanine and other amino acids has been continued (see previous progress reports). Besides an additional number of peptides containing phenylalanine, ornithine and tyrosine, the synthesis of glutamic acid peptides has been started. Pure α- and γ-glutamyl peptides were prepared.

The ultra-violet absorption of the tyrosine and phenylalanine peptides will be studied in detail. The optical properties and optical rotatory power of the new peptides are being investigated and correlated with previous results. This work is being continued and extended to other amino acids.

Decapeptide Corresponding to Gramicidin-S: Gramicidin-S is probably a cyclic decapeptide of the following structure:



(L-L-L-D-L-L-L-L-D-L)

It therefore consists of a pentapeptide repeated once with a peptide bond between the terminal amino and carboxyl groups. Thus Gramicidin-S contains no other ionizable

groups than the two basic delta amino groups of the two ornithine residues.

In attempting the synthesis of this cyclic peptide, a wrong start was made, due to the unsuspected racemization in the Boissonnas procedure, as explained in previous progress reports.

The successful synthesis of both the pentapeptide and the decapeptide (as hydrochlorides) corresponding to Gramicidin-S can now be reported:

H.Val-Orn-Leu-Phe-Pro.OH.2HCl (L-L-L-D-L)

H.Val-Orn-Leu-Phe-Pro—Val-Orn-Leu-Phe-Pro.OH.3HCl (L-L-L-D-L—L-L-L-D-L)

The properties of the new peptides are being studied, and attempts at ring closure will be made.

Bibliography

E. Brand.
Optical Rotation of Peptides.
II^{e} Congrès International de Biochimie, Paris, 21-27 Juliet 1952.

G. Bernini and E. Brand.
Synthesis and Optical Properties of Some Alanine and Phenylalanine Peptides.
II^{e} Congrès International de Biochimie, Paris, 21-27 Juliet 1952.

Lectures by E. Brand:

"Praktische Erfahrungen in der Synthese von Peptiden"
1. Department of Organic Chemistry, Freie Universität, Berlin-Dahlem, Germany
2. Department of Chemistry, University of Heidelberg, Germany

"Optische Drehung von Aminosäureresten in Peptiden"
1. Department of Organic Chemistry, Freie Universität, Berlin-Dahlem, Germany
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